# Annexure III
# Study Schema of Bachelor of Science in Artificial Intelligence
## (Fall 2025)

## Introduction

The objective of the bachelor's degree in Artificial Intelligence program is to produce well-rounded graduates, having a strong foundation in theoretical concepts and skills to design and implement complex intelligent software using multiple programming technologies under different operating systems and backend technologies. Also, strong academic preparation to pursue careers in local and international IT industry where they can communicate effectively and to continue seeking education through formal or informal methods.

Eligibility Criteria

The minimum requirements for admission in the program are any of the following:

(a) At least 50% marks in Intermediate (HSSC) examination with Mathematics
or equivalent qualification with Mathematics, certified by IBCC.

OR

(a) At least 50% marks in Intermediate (HSSC) examination with Pre-Engineering, Pre-Medical or
equivalent qualification, certified by IBCC.

**Deficiency:**

"Students with pre-medical, must have to pass deficiency courses of Mathematics of 6 credit hours in first two semesters."

## Duration

The minimum duration for completion of the degree is four years. The HEC allows a maximum period of seven years to complete BS degree requirements.

## Degree Completion Requirements

To become eligible for award of BS degree, a student must satisfy the following requirements:

a) Must have studied and passed the prescribed courses, totaling at least 134 credit hours.

b) Must have earned CGPA (Cumulative Grade Point Average) of at least 2.0 on a scale of 4.0.

## Graduate Attributes (GAs) / Program Learning Outcome (PLOs)

This degree program prepares students to attain educational objectives by ensuring that students demonstrate achievement of the following outcomes (derived from Graduate Attributes defined by Seoul Accord www.seoulaccord.org).

| S. No. | Graduate Attributes (GAs) | Computing Professional Graduate Outcomes |
|---|---|---|
| 1 | Academic Education | To prepare graduates as AI professionals |
| 2 | Knowledge for Solving Computing Problems | Apply knowledge of AI, knowledge of an AI specialization, and mathematics, science, and domain knowledge appropriate for the AI specialization to the abstraction and conceptualization of AI models from defined problems and requirements |
| 3 | Problem Analysis | Identify, formulate, research literature, and solve complex AI-related problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines |
| 4 | Design/ Development of Solutions | Design and evaluate solutions for complex AI problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations |
| 5 | Modern Tool Usage | Create, select, adapt, and apply appropriate techniques, resources, and modern computing tools to complex AI activities, with an understanding of the limitations |
| 6 | Individual and Team Work | Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings |
| 7 | Communication | Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions |
| 8 | AI Professionalism and Society | Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional AI practice |
| 9 | Ethics | Understand and commit to professional ethics, responsibilities, and norms of professional AI practice |
| 10 | Life-long Learning | Recognize the need, and have the ability, to engage in independent learning for continual development as a AI professional |

## Program Educational Objectives (PEOs)

1. **Proficiency in Computing and Artificial Intelligence Fundamentals** - A graduate capable of applying foundational knowledge in computing and artificial intelligence to excel in professional endeavors.
2. **Critical Analysis**- The program aims to cultivate graduates equipped with the ability to conduct thorough critical analysis of complex problems. They will demonstrate proficiency in identifying computing requirements essential for crafting effective computer-based solutions
3. **Ethical Awareness and Social Responsibility** - A graduate who integrates ethical considerations and societal implications, particularly in the realm of artificial intelligence and its implementations, into professional practice.
4. **Effective Communication Proficiency** - A graduate skilled in conveying technical and managerial information both verbally and in writing.
5. **Leadership Aptitude** - A graduate proficient in leading teams or navigating entrepreneurial environments effectively.
6. **Commitment to Continuous Learning and Innovation** - A graduate committed to exploring new domains within computing and artificial intelligence to benefit their organization or to engage in academic research.

## Graduate Attributes (GAs) – Program Educational Outcomes (PEOs) Mapping

| PEOs | Graduate Attributes (GAs) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | GA 1 | GA 2 | GA 3 | GA 4 | GA 5 | GA 6 | GA 7 | GA 8 | GA 9 | GA 10 |
| PEO 1 | * | * | * | * | - | - | - | - | - | - |
| PEO 2 | - | - | * | * | - | - | - | - | - | - |
| PEO 3 | - | - | - | - | - | - | - | * | * | - |
| PEO 4 | - | - | - | - | - | * | * | - | - | - |
| PEO 5 | - | - | - | - | - | * | - | * | - | - |
| PEO 6 | - | - | - | - | * | - | - | - | - | * |

## Curriculum Design

The structure of BS in AI program is proposed to meet the needs of students through theory and practical experience. The students are expected to learn theoretical and practical understanding of AI and its sub-domains.

The proposed structure is dynamic and provides basis for various options including Breadth-Based, Depth-Based, and Integrated Breadth & Depth Based specializations. Student may choose a particular option, which is most appropriate to their planned future career. The following are some relevant details:

- Minimum credit hours shall be 134 for BS (AI) program.
- The program comprises eight semesters spread over four years.
- The following table gives the distribution of credit hours in different domains of knowledge.

## Generic Structure of Computing Discipline

| Areas | Credit Hours | Courses |
|---|---|---|
| Computing Core | 46 | 14 |
| Domain Core | 18 | 6 |
| Domain Electives | 21 | 7 |
| Mathematics & Supporting Courses | 12 | 4 |
| Elective Supporting Courses | 3 | 1 |
| General Education Requirements | 34 | 15 |
| **Total** | **134** | **47** |

## Mapping of BSAI Program on the Generic Structure

| S. No | Semester | Code | Pre-Req | Course Title | Domain | Credit Hours |
|---|---|---|---|---|---|---|
| **Computing Core (46/134) 14 Courses** | | | | | | |
| 1 | 1 | CS102 | | Programming Fundamentals | Core | 4(3-3) |
| 2 | 2 | CS150 | PF | Object Oriented Programming | Core | 4(3-3) |
| 3 | 2 | CS151 | | Database Systems | Core | 4(3-3) |
| 4 | 3 | CS202 | | Digital Logic Design | Core | 3(2-3) |
| 5 | 3 | CS201 | PF | Data Structures | Core | 4(3-3) |
| 6 | 4 | CS254 | | Information Security | Core | 3(3-0) |
| 7 | 4 | CS253 | | Artificial Intelligence | Core | 3(2-3) |
| 8 | 3 | CS203 | | Computer Networks | Core | 3(2-3) |
| 9 | 3 | CS204 | | Software Engineering | Core | 3(3-0) |
| 10 | 4 | CS250 | DLD | Computer Organization & Assembly Language | Core | 3(2-3) |
| 11 | 5 | CS301 | | Operating Systems | Core | 3(2-3) |
| 12 | 6 | CS352 | DS | Analysis of Algorithm | Core | 3(3-0) |
| 13 | 7 | CS401 | | Final Year Project-I | Core | 2(0-4) |
| 14 | 8 | CS450 | FYP-I | Final Year Project-II | Core | 4(0-12) |
| **Domain Core (18/134) 6 Courses** | | | | | | |
| 15 | 4 | CS257 | | Programming for AI | Domain Core | 3(2-3) |
| 16 | 5 | CS307 | | Machine Learning | Domain Core | 3(2-3) |
| 17 | 6 | CS351 | | Artificial Neural Network & Deep Learning | Domain Core | 3(2-3) |
| 18 | 4 | CS258 | | Knowledge Representation and Reasoning | Domain Core | 3(2-3) |
| 19 | 5 | CS306 | | Computer Vision | Domain Core | 3(2-3) |
| 20 | 6 | CS351 | | Parallel & Distributed Computing | Domain Core | 3(2-3) |
| **Mathematics & Supporting Courses (12/134) 4 Courses** | | | | | | |
| 21 | 3 | MT201 | CAG | Multivariable Calculus | Maths | 3(3-0) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | 5 | MT301 | CAG | Linear Algebra | Maths | 3(3-0) |
| 23 | 4 | MT250 | | Probability & Statistics | Maths | 3(3-0) |
| 24 | 5 | EN350 | FE | Technical & Business Writing | EN | 3(3-0) |
| **General Education Requirement as per HEC UG Education Policy (34/134) 15 Courses** | | | | | | |
| 25 | 1 | GE101 | | Application of Information & Communication Technologies | GER | 3(2-3) |
| 26 | 1 | GE105 | | Functional English | GER | 3(3-0) |
| 27 | 2 | GE152 | FE | Expository Writing | GER | 3(3-0) |
| 28 | 1 | GE104 | | Quantitative Reasoning – 1 (Discrete Structures) | GER | 3(3-0) |
| 29 | 2 | GE151 | | Quantitative Reasoning – 2 (Calculus and Analytic Geometry) | GER | 3(3-0) |
| 30 | 1 | GE102 | | Islamic Studies | GER | 2(2-0) |
| 31 | 1 | GE106 | | Pakistan Studies | GER | 2(2-0) |
| 32 | 2 | GE153/ GE154 | | Fehm-e-Quran I / Comparative Religion - I | GER | 1 (0-1) |
| 33 | 4 | GE253/ GE254 | | Fehm-e-Quran II / Comparative Religion – II | GER | 1 (0-1) |
| 31 | 3 | GE201 | | Ideology and Constitution of Pakistan | GER | 2(2-0) |
| 32 | 8 | GE450 | | Social Sciences (Example: Introduction to Management) | GER | 2(2-0) |
| 33 | 2 | GE150 | | Natural Sciences (Applied Physics) | GER | 3(2-3) |
| 34 | 8 | GE451 | | Arts & Humanities (Professional Practices) | GER | 2(2-0) |
| 35 | 8 | GE452 | | Civics and Community Engagement | GER | 2(2-0) |
| 36 | 7 | GE401 | | Entrepreneurship | GER | 2(2-0) |
| **List of Elective Supporting Courses (3/134) 1 Course** | | | | | | |
| 37 | 7 | SS401 | | Social Science (Example: Introduction to Marketing) | SS | 3(3-0) |
| 38 | | SS4xx | | Social Science (Example: Financial Accounting) | SS | 3(3-0) |
| 39 | | SS4xx | | Research Methods | SS | 3(3-0) |
| 40 | | SS4xx | | Organizational Behavior | SS | 3(3-0) |
| 41 | | SS4xx | | International Relations | SS | 3(3-0) |
| 42 | | | | | | |
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| 45 | | | | | | |
| **Domain Elective (21/134) 7 Courses** | | | | | | |
| 46 | 5 | CS3xx | | Natural Language Processing | Domain Elec | 3(2-3) |
| 47 | 5 | CS3xx | | Speech Processing | Domain Elec | 3(2-3) |
| 48 | 6 | CS3xx | | Data Mining | Domain Elec | 3(2-3) |
| 49 | 6 | CS3xx | | Advanced Statistics | Domain Elec | 3(2-3) |
| 50 | 6 | CS3xx | | Reinforcement Learning | Domain Elec | 3(2-3) |
| 51 | 6 | CS3xx | | Theory of Automata | Domain Elec | 3(2-3) |
| 52 | 7 | CS4xx | | HCI & Computer Graphics | Domain Elec | 3(2-3) |
| 53 | | CSxxx | | Fuzzy Systems | Domain Elec | 3(2-3) |
| 54 | | CSxxx | | Swarm Intelligence | Domain Elec | 3(2-3) |
| 55 | | CSxxx | | Agent Based Modeling | Domain Elec | 3(2-3) |
| 56 | | CSxxx | | Knowledge Based Systems | Domain Elec | 3(2-3) |
| 57 | | CSxxx | | Web Engineering | Domain Elec | 3(2-3) |
| 58 | | CSxxx | | Front-end Development Technologies | Domain Elec | 3(2-3) |

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|---|---|---|---|---|---|---|
| 59 | | CSxxx | | Back-end Technologies | Domain Elec | 3(2-3) |
| 60 | | CSxxx | | Full Stack Development | Domain Elec | 3(2-3) |
| 61 | | CSxxx | | MERN Stack Development | Domain Elec | 3(2-3) |
| 62 | | CSxxx | | DevOps | Domain Elec | 3(2-3) |
| 63 | | CSxxx | | Data Science | Domain Elec | 3(2-3) |
| 64 | | CSxxx | | Computer Vision | Domain Elec | 3(2-3) |
| 65 | | CSxxx | | Digital Image Processing | Domain Elec | 3(2-3) |
| 66 | | CSxxx | | MLOPs | Domain Elec | 3(2-3) |
| 67 | | CSxxx | | Business Intelligence | Domain Elec | 3(2-3) |
| 68 | | CSxxx | | E-Commerce and Digital Marketing | Domain Elec | 3(2-3) |
| 69 | | CSxxx | | Mobile Application Development | Domain Elec | 3(2-3) |
| 70 | | CSxxx | | Large Language Models | Domain Elec | 3(2-3) |
| 71 | | CSxxx | | MLOps | Domain Elec | 3(2-3) |
| 72 | | CSxxx | | Robotics | Domain Elec | 3(2-3) |
| 73 | | CSxxx | | Explainable AI | Domain Elec | 3(2-3) |
| 74 | | CSxxx | | Generative AI | Domain Elec | 3(2-3) |
| 75 | | CSxxx | | Human Robot Interaction | Domain Elec | 3(2-3) |
| 76 | | CSxxx | | Graph Theory | Domain Elec | 3(3-0) |
| 77 | | CSxxx | | Blockchain Technologies | Domain Elec | 3(3-0) |
| 7 | | CSxxx | | Information Design | Domain Elec | 3(2-3) |
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# Semester-wise Plan of BS in Artificial Intelligence (BS-AI) Program

| # | Code | Pre-Reqs | Course Title | Domain | Cr Hr (Cont Hr) |
|---|---|---|---|---|---|
| **Semester 1** | | | | | |
| 1 | CS102 | | Programming Fundamentals | Core | 4 (3-3) |
| 2 | GE101 | | Application of Information & Communication Technologies | GER | 3 (2-3) |
| 3 | GE104 | | QR 1 (Discrete Structures) | GER | 3 (3-0) |
| 4 | GE102 /103 | | Islamic Studies / Ethics | GER | 2 (2-0) |
| 5 | GE106 | | Pakistan Studies | General | 2 (2-0) |
| 6 | GE105 | | Functional English | GER | 3 (3-0) |
| 7 | MT101 | | Additional Math Course 1 (for pre-medical students) | Non-Credit | 0 (0-0) |
| | | | | **Total Cr Hrs** | **17 (15-6)** |
| **Semester 2** | | | | | |
| 1 | CS150 | PF-CS102 | Object Oriented Programming | Core | 4 (3-3) |
| 2 | CS151 | | Database Systems | Core | 4 (3-3) |
| 3 | GE150 | | Natural Science (Applied Physics) | GER | 3 (2-3) |
| 4 | GE151 | | QR 2 (Calculus and Analytic Geometry) | GER | 3 (3-0) |
| 5 | GE152 | FE GE-105 | Expository Writing | GER | 3 (3-0) |
| 6 | MT150 | | Additional Math Course 2 (for pre-medical students) | Non-Credit | 0 (0-0) |
| 7 | GE153 / GE154 | | Fehm-e-Quran I / Comparative Religion - I | General | 1 (0-1) |
| | | | | **Total Cr Hrs** | **18 (14-10)** |
| **Semester 3** | | | | | |
| 1 | CS201 | PF-CS102 | Data Structures | Core | 4 (3-3) |
| 2 | MT201 | CAG GE-151 | Multivariate Calculus | Maths | 3 (3-0) |
| 3 | CS202 | | Digital Logic Design | Core | 3 (2-3) |
| 4 | CS203 | | Computer Networks | Core | 3 (2-3) |
| 6 | CS204 | | Software Engineering | Core | 3 (3-0) |
| 7 | GE201 | | Ideology and Constitution of Pakistan | GER | 2 (2-0) |
| | | | | **Total Cr Hrs** | **18 (15-9)** |
| **Semester 4** | | | | | |
| 1 | CS250 | DLD CS-202 | Computer Organization & Assembly Language | Core | 3 (2-3) |
| 2 | CS253 | | Artificial Intelligence | Core | 3 (2-3) |
| 3 | MT250 | | Probability & Statistics | Maths | 3 (3-0) |
| 4 | CS254 | | Information Security | Core | 3 (3-0) |
| 5 | CS257 | | Domain Core 1 (Programming for AI) | Domain Core | 3 (2-3) |
| 6 | CS258 | | Domain Core 2 (Knowledge Representation & Reasoning) | Domain Core | 3 (2-3) |
| 7 | GE253 / GE254 | | Fehm-e-Quran II / Comparative Religion – II | General | 1 (0-1) |

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|---|---|---|---|---|---|
| | | | | **Total Cr Hrs** | **19 (15-10)** |
| **Semester 5** | | | | | |
| 1 | CS301 | | Operating Systems | Core | 3 (2-3) |
| 2 | CS306 | | Domain Core 3 (Computer Vision) | Domain Core | 3 (2-3) |
| 3 | CS307 | | Domain Core 4 (Machine Learning) | Domain Core | 3 (2-3) |
| 4 | CS3xx | | Domain Elective 1 | Domain Elec | 3 (2-3) |
| 5 | CS3xx | | Domain Elective 2 | Domain Elec | 3 (2-3) |
| 6 | MT301 | CAG GE-151 | Linear Algebra | Maths | 3 (3-0) |
| | | | | **Total Cr Hrs** | **18 (12-15)** |
| **Semester 6** | | | | | |
| 1 | CS354 | | Domain Core 5 (Artificial Neural Networks & Deep Learning) | Domain Core | 3 (2-3) |
| 2 | CS351 | OS CS-301 | Domain Core 6 (Parallel & Distributed Computing) | Domain Core | 3 (2-3) |
| 3 | CS3xx | | Domain Elective 3 | Domain Elec | 3 (2-3) |
| 4 | CS3xx | | Domain Elective 4 | Domain Elec | 3 (2-3) |
| 5 | CS352 | DS CS-201 | Analysis of Algorithm | Core | 3 (3-0) |
| 6 | EN350 | FE GE-105 | Technical & Business Writing | EN | 3 (3-0) |
| | | | | **Total Cr Hrs** | **18 (14-12)** |
| **Semester 7** | | | | | |
| 1 | CS401 | | Final Year Project - I | Core | 2 (0-6) |
| 2 | CS4xx | | Domain Elective 5 | Domain Elec | 3 (2-3) |
| 3 | SS401 | | Elective Supporting Course (Example: Introduction to Marketing) | SS | 3 (3-0) |
| 4 | CS4xx | | Domain Elective 6 | Domain Elective | 3 (2-3) |
| 5 | CS4xx | | Domain Elective 7 | Domain Elective | 3 (2-3) |
| 6 | GE401 | | Entrepreneurship | GER | 2 (2-0) |
| | | | | **Total Cr Hrs** | **16 (11 -15)** |
| **Semester 8** | | | | | |
| 1 | CS450 | CS401 - FYP-I | Final Year Project – II | Core | 4 (0-12) |
| 2 | GE450 | | Social Science (Example: Introduction to Management) | GER | 2 (2-0) |
| 3 | GE451 | | Arts & Humanities (Professional Practices) | GER | 2 (2-0) |
| 4 | GE452 | | Civics and Community Engagement | GER | 2 (2-0) |
| | | | | **Total Cr Hrs** | **10 (6-12)** |